Technology Opportunity
Glenn Research Center • Cleveland • Ohio
Technology Transfer & Partnership Office
TOP3–00159

Atomic Oxygen Surface Modification and Texturing for Biomedical Applications

Technology

Atomic oxygen surface modification and texturing technology is being evaluated for use in a number of biomedical applications. It is useful for changing the wetting characteristics of surfaces, improving cell growth and adhesion in commercially produced cell culturing containers and removing biologically active contaminants such as endotoxins, from the surfaces of orthopaedic implants. NASA seeks companies that are interested in developing and commercializing these types of processes.

Benefits

Surface texturing of polymers for cell growth containers and probes

- Significant increases in cell attachment over current state of the art
- Reduction in the cost of production of pharmaceuticals
- Improved wetting and surface area for diagnostic probes

Endotoxin removal

- Reduced inflammation and associated joint pain
- Reduction in health care costs associated with surgical complications and revision of implants
- Increased functional life of implants

Commercial Applications

- Textured surface of fiber optics for glucose monitors
- Textured cell and tissue culturing containers for improved cell growth and adhesion
- Textured surface of fiber optics for more uniform illumination for photodynamic therapy
- Removal of endotoxins from the surfaces of surgical implants for improved fixation of soft tissue implants

Technology Description

Technology developed for simulation of the space environment (Figure 1) has made it possible to chemically modify and/or texture the surface of polymers in a manner not possible to do by conventional wet chemistry processes (Figure 2). The resulting surfaces have been shown to improve cell attachment and growth. Researchers at the NASA

Figure 1.—Large area atomic oxygen exposure facility.

Glenn Research Center also have used this process as an innovative approach to solve the problem of endotoxin contamination on the surfaces of orthopaedic implants. No known chemical process fully removes endotoxins without damaging the implants. Sterilization, likewise, does not remove endotoxins. NASA's approach consists of an atomic oxygen treatment process that occurs in a low-pressure (4 to100 microns) air plasma and at a relatively low temperature (<60 °C), converting endotoxins into harmless gases.

Options for Commercialization

One of NASA's missions is to commercialize its technology. Glenn will work through individual task orders to tailor atomic oxygen surface modification technology to specific commercial needs, and to assist customers with scale-up of the technology. Additional development might be needed to optimize and further refine the properties for specific applications. If your company is interested in this technology or you desire additional information, please contact us.

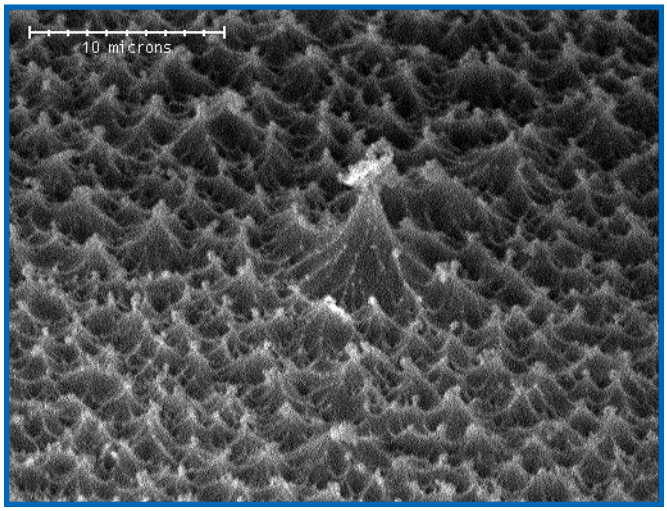

Figure 2.—Atomic oxygen textured chlorotrifluoroethylene.

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References

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